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ABSTRACT

An individualized, computer-assisted instruction (CAI) program of courses in algebra and general mathematics was developed for ninth graders. The courses are on-line; the students receive instruction and their performances are recorded to direct the flow of instruction and to assign appropriate off-line instructional materials. Flowcharts have been developed to illustrate the structure of a chapter of the course and an instructional block within a chapter for course correction and revision purposes. Functions of personnel for the summer of 1970 have been outlined, and facilities and schedules to be used have been identified. (EM 011 037 through EM 011 043, EM 011 046, EM 011 047, and EM 011 049 through EM 011 058 are related documents.) (SH)

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Commonwealth CAI Consortium
ESEA Title III Project No. 5523
Technical Report, June 30, 1970

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Course Development

The Algebra I and General Mathematics courses under development are directed to a ninth grade student population. The essential innovative feature of these courses is a tutorial instruction program under computer control. This "on-line" program is supplemented by a variety of more conventional individualized learning experiences.

The students receive basic instruction in mathematical concepts from the computer-assisted instruction program. A record of the student's interaction with the CAI program is stored in the computer. These performance data serve to direct the flow of the "on-line" instruction. The student, whose performance indicates rapid acquisition of the mathematical concepts, by-passes the detailed instruction required to bring a less able student to criterion.

In addition to controlling the flow of the CAI program, the student performance data enable the CAI classroom teacher to assign appropriate "off-line" instructional materials to meet the individual needs of each student. These materials include film-strips, mathematical games, programed instruction materials, printed materials, and manipulative materials.

Professor Thomas Kieren, mathematics educator in the College of Education, has assumed the responsibility of authoring the unwritten chapters in algebra and general mathematics. He is assisted by Consortium staff members who have had experience teaching high school mathematics.

Tests have been developed for on-line administration at the end of each chapter of the algebra and general mathematics courses. The test items parallel the format and content of questions presented in the instructional portion of the program and the on-line quizzes. The chapter tests should be viewed as criterion tests for the chapters. If a student's performance is unsatisfactory, the areas of difficulty may be identified by the teacher and remedial activities prescribed.

Development of on-line course material was continued for chapters six, seven, and eight of algebra and chapter ten in general mathematics. Ray Bello and Warner Johnson, CAI teachers at Lincoln, submitted course materials for sections of chapter ten in the general mathematics course, thus fulfilling their commitment to author course materials during the academic year.

Course Correction and Revision

Experience with the programs in the CAI classrooms at Lincoln and Schenley has indicated the need to reorganize the on-line programs to provide a consistent structure to the on-line material and to help in orienting and organizing the off-line material. This consistent structure will allow for a more detailed evaluation of the courses. The new structure will also provde for criterion-referenced progress in addition to interactive monitoring of retention through prerequisite tests.

The attached flowcharts illustrate the structure of a chapter and an instructional block within a chapter. Flowchart I indicates the flow of the program within a chapter. A preskills test will test the prerequisite skills taught in previous chapters of the current course and the more sophisticated concepts introduced in previous mathematics courses. They will not test for the basic arithmetic operations that all students should have acquired by this point in their schooling. Experience has shown that some students will be deficient in these skills. It will be the responsibility of the teachers to identify these students. On-line drill programs in the basic operations are available for the practice necessary to develop proficiency with the basic arithmetical operational skills.

Blocks labeled "Remedial" in Flowchart I indicate that remedial instruction will be provided in the areas indicated by inadequate performance on tests. This instruction will be provided on-line if the appropriate instruction exists; otherwise, off-line materials will be available to provide the remediation.

Flowchart II illustrates the structure and program flow for an instructional block. The quantity of material in an instructional block was determined by an analysis of the student records acquired from the Lincoln and Schenley CAI classes. The innovative features of an instructional block are the pretests, the summary, the criterion quiz, and the option to return to a previous instructional sequence within a block if criterion on that block was not attained. These features supplement the instructional and practice material that presently exist in the original on-line program.

The off-line assignments will be the original materials designated for that purpose. In some cases, particularly genma, it will be necessary to provide additional off-line material to accommodate the additional blocks created by sub-dividing the original instructional blocks.

The original off-line assignments prescribed by the on-line program are intended to provide practice with the concepts developed in an instructional block. They do not provide for off-line remedial instruction or enrichment activities. During the past year, it was the responsibility of the CAI classroom teachers to identify the needs of their students and make appropriate assignments of off-line activities from available materials. The proposed utilization plan for the 1970-71 academic year calls for a higher pupil-teacher ratio. This will necessitate a greater use for on-line prescription of a greater variety of off-line activities. The students should also be taught to be responsible for selecting off-line activities that will be of interest to them and still fulfill the requirements to achieve success in their mathematics course.

A major effort must be made to identify and provide the appropriate off-line activities. On-line prescriptions must be inserted in the on-line program. Methods must be explored to make the off-line material available to the students with a minimum amount of teacher supervision. Perhaps the most critical task for the CAI

teachers in the coming year will be to teach the students to function successfully in an environment that gives the student more control over his learning situation than he has previously experienced in his school career.

Personnel

A meeting of the CAI teachers from Lincoln and Schenley with Penn State Consortium personnel was held at University Park on June 18, 1970. The purposes of the meeting were to review the classroom operations during the 1969-70 academic year and to assign areas of responsibilities for revising the existing program and developing new materials for Summer, 1970.

Tasks for the summer were assigned as follows:

Penn State

1. Make necessary revisions to the on-line programs to implement the flowchart.
2. Develop pre-skills tests.
3. Develop pretests.
4. Develop out quizzes.
5. Develop summaries.
6. Complete algeb chapters 6, 7, and 8.
7. Complete genma chapter 10.
8. Update the teacher's manual.

Philadelphia

Warner Johnson and John Murray:

1. Evaluate algeb flowchart and control sheets.
2. Review and revise algeb chapter tests.
3. Develop algeb student manual.
4. Develop off-line assignments and coordinate them with on-line instructional blocks.

Ray Bello (prior to leaving for France):

1. Coordinate worksheets with on-line instructional blocks and develop additional worksheets, where necessary, for genma chapters 1, 2, 3, 5, and 6.

Pittsburgh

Kitty Folger:

1. Evaluate algeb flowcharts and control sheets.
2. Review and revise algeb chapter tests.
3. Make suggested revisions to algeb chapters 2 and 5.
4. Author chapter 9.

Roland Lazzaro:

1. Evaluate genma flowcharts and control sheets.
2. Review and revise genma chapter tests.
3. Develop genma student manual.
4. Coordinate existing off-line activities with on-line program.

Facilities

An IBM 1500 system with eight 1510 instructional stations with typewriter keyboards and light pens and eight 1510 image projectors are operating in Lincoln and Schenley High Schools. The Consortium staff continued to use approximately fifty per cent of Penn State's CAI system during the present report period.

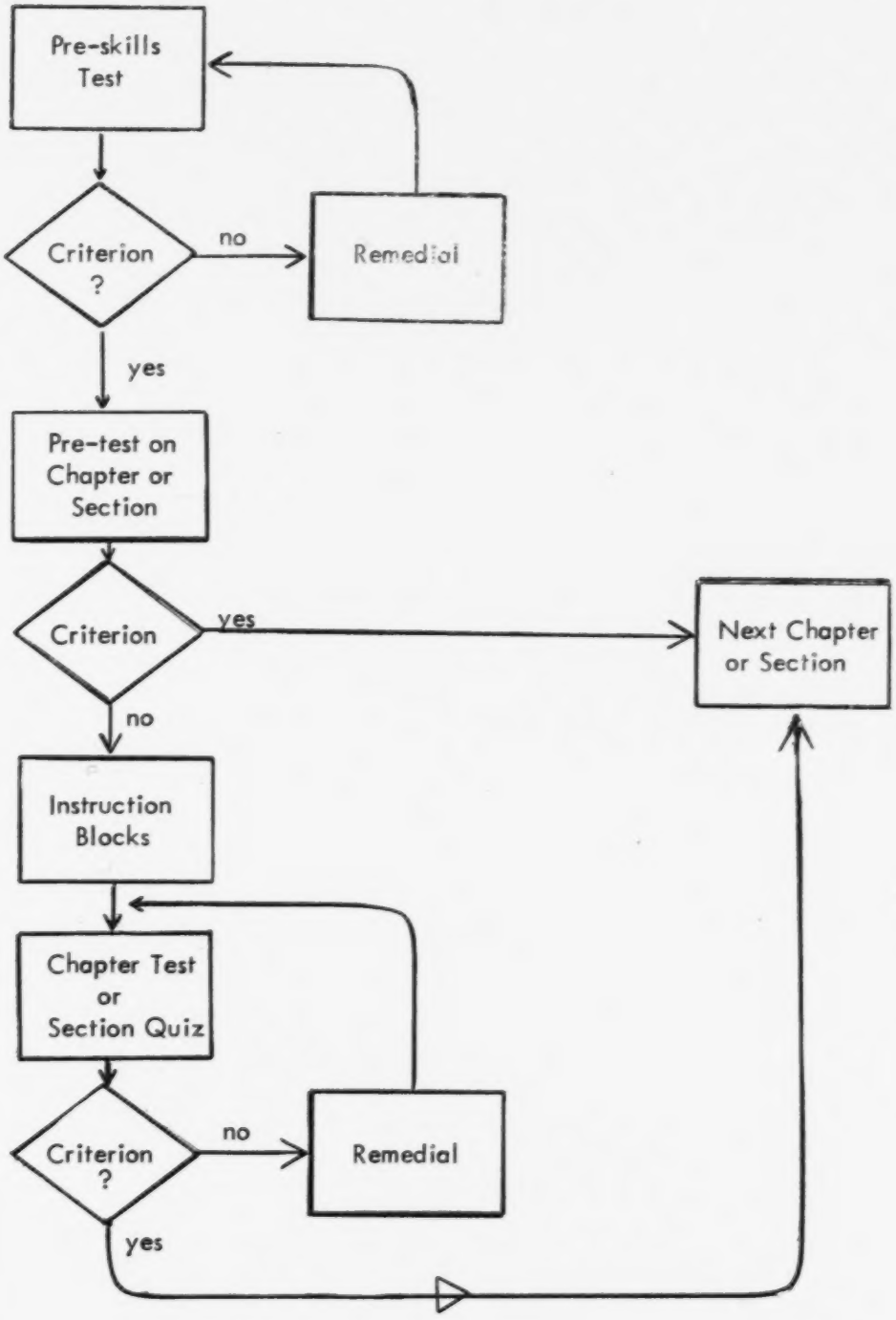
Schedule

Target dates for the current funding period:

February 22, 1970	to	June 30, 1970	Complete Chapters 6 through 8 in Algebra and Chapter 10 in general mathematics.
February 22, 1970	to	June 10, 1970	Continue formal CAI mathematics education program at Schenley High School, Pittsburgh.
February 22, 1970	to	June 24, 1970	Continue formal CAI mathematics education program at Lincoln High School, Philadelphia.

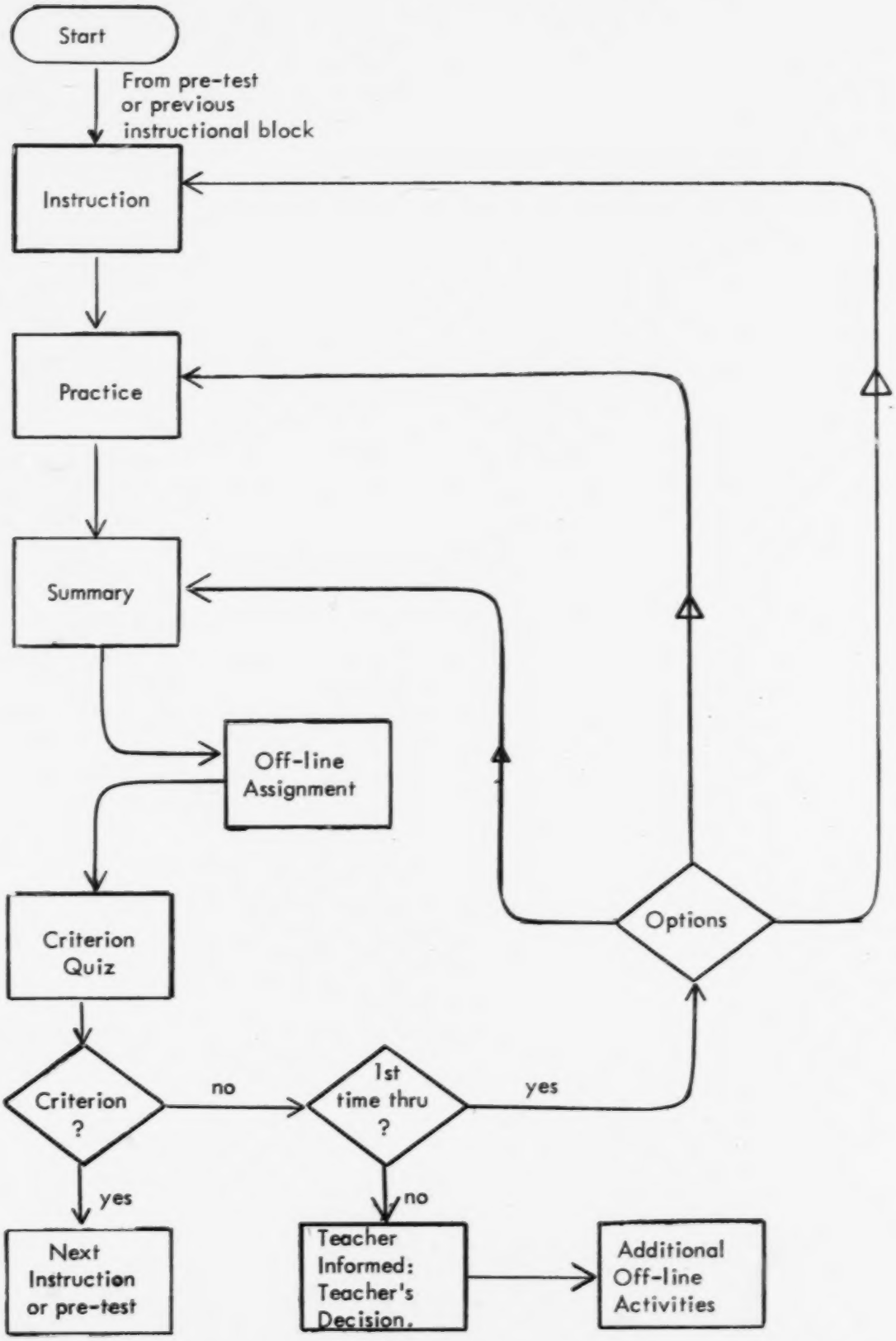
FLOWCHART I

Chapter or Section of a Chapter



FLOWCHART II

Instructional Block



Note to accompany the Penn State Documents.

In order to have the entire collection of reports generated by the Computer Assisted Instruction Lab. at Penn State University included in the ERIC archives, the ERIC Clearinghouse on Educational Media and Technology was asked by Penn State to input the material. We are therefore including some documents which may be several years old. Also, so that our bibliographic information will conform with Penn State's, we have occasionally changed the title somewhat, or added information that may not be on the title page. Two of the documents in the CARE (Computer Assisted Remedial Education) collection were transferred to ERIC/EC to abstract. They are Report Number R-36 and Report Number R-50.

— Joe McCall: /ERIC/EM